

*Office of Technical Assistance Research Proposal*  
***Alternatives to Sodium Hydroxide (NaOH) used in Textile Scouring***

**Background**

Sizing is applied to textile fibers to impart desirable properties prior to weaving. Size helps improve the strength of the fiber, increases its flexibility and bending properties, and reduces the downtime of weaving operations. Typical sizing materials include starch, polyvinyl alcohol, and amylose derivatives along with auxiliaries such as adhesives, defoamers, and lubricants that help to improve efficiency. The sizing agent along with waxes and oils that are naturally occurring in cotton, wool and other fibers are removed through wet processing prior to fabric dyeing.

Typically there are four steps in the wet processing operation:

1. Desizing - where the sizing agent is removed,
2. Scouring - where waxes, oils and other impurities are removed from the fiber,
4. Mercerizing - where the fabric fibers are swollen and further strengthened,
3. Bleaching - where the fabric is treated to eliminate undesired coloring.

This proposal will focus on the scouring process and the use of sodium hydroxide (NaOH) to remove pectin, wax, oils and other impurities present on the natural fibers and woven material. Sodium hydroxide is the primary scouring agent used by the textile industry. The chemical has the undesirable property of being extremely corrosive to equipment and to humans. It is currently listed as a reportable chemical under the Massachusetts Toxic Use Reduction Act (TURA), and companies that use in excess of 10,000 pounds per year must prepare annual chemical use reports and TURA plans. The plans are designed to assist the company in identifying ways to use the chemical more efficiently and to explore ways that might eliminate the use of the chemical in the manufacturing process all together.

**Sodium Hydroxide Use in Textiles**

In Massachusetts in 1998, there were 13 textile companies (SIC codes 2259-2299) each using over 10,000 pounds of sodium hydroxide. In total, these 13 companies used more than 6.2 million pounds of NaOH and generated more than 4.9 million pounds of NaOH byproducts or waste that needed further treatment before being discharged or disposed. Statewide, NaOH is the number one chemical reported in terms of byproduct generated with nearly 16 million pounds of waste generated annually. Over 84,000,000 pounds of the chemical was used by 223 Massachusetts facilities in 1998.

**Alternatives to NaOH**

Additional research is needed to identify and evaluate the universe of alternates to NaOH used in textile scouring operations. Other industry sectors have found alternative cleaning agents for removing oils and wax. The metal fabrication industry traditionally used chlorinated solvents to remove these contaminants, however, during the 1990s the industry shifted to the use of detergents and alkaline cleaners as cost effective alternatives. Could detergents be substituted for sodium hydroxide?

A cursory Internet search revealed that a few companies are selling scouring alternatives based

on anionic and nonionic surfactant chemistry. Are these alternatives approaching the same effectiveness as NaOH?

The Massachusetts Office of Technical Assistance prepared a case study in 1994 on Mastex Industries, of Holyoke, Mass an integrated textile manufacturer. Mastex substituted sodium carbonate in scouring operations. Can this be considered a viable alternative for the rest of the textile industry performing scouring?

Natural chemicals from citrus such as turpenes have been used in cleaning and dewaxing parts. Can they be used effectively in textile scouring?

### **Scope of Work**

Initial research would involve a literature search to identify potential alternatives. Followed by bench-scale testing of the scouring agents to evaluate their effectiveness at removing the contaminants. The evaluation could also include the use of different cleaning techniques or equipment such as ultrasonic cleaning, spray washing, and immersion. If any of these alternatives perform comparably to NaOH, the next step would be to scale up promising alternatives. OTA has contacts at several textile facilities in southeastern Massachusetts that may be interested in participating in project scale up. OTA can work with the principle investigator to find an appropriate demonstration site if desired.